

REMARKS

Claim 1, 3-10, 12-14 and 16-20 remain in the application. Independent claim 16 has been amended to include the limitation of an etch stop layer disposed above and on the first dielectric layer. Dependent claims 18-20 have been amended to include the etch stop layer limitation. Support for these amendments may be found in the Detailed Description section of the current application, page 14, lines 8-17. No new matter has been added with this amendment.

A.. 35 U.S.C. § 103(a)

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Chen in view of Fink - Claims 1, 5-8

Claims 1 and 5-8 stand rejected under 35 U.S.C. § 103(b) as being unpatentable over the U.S. Patent No. 6,211,061 B1 issued April 3, 2001 to Chen et al. (hereinafter "the Chen patent") (Office Action, page 2) in view of Fink et al. (Standard Handbook for Electrical Engr, McGraw-Hill, NY 1968) (hereinafter the "Fink reference"). For at least the reasons set forth below, Applicants submit that the claims 1 and 5-8 are not rendered obvious by the Chen patent in view of the Fink reference.

With regard to claim 1, the Office relies on the Chen patent (col. 5, line 65 through col. 6, line 22) for a teaching of a “diffusion barrier layer 24 that has an etch stop layer above and on the diffusion barrier layer, the etch stop layer having a thickness in the range of 1600 to 7,000 angstroms, and an interlayer dielectric of thickness 1,000 to 3,000 angstroms. (Office Action, page 2). However, the Office mistakenly construes the low k dielectric layer 30, which has a thickness of between about 1600 angstroms and 7,000 angstroms (col 6, lines 7-12) to be an etch stop layer. While it is true that the low k dielectric layer 30 is disposed on the barrier layer 24, the low k dielectric layer 30 does not act as an etch stop. An etch stop layer is typically used to stop an etch process, as its name suggests. For example, the Chen patent teaches the low k dielectric layer 30 being etched through an opening, and then the etch is stopped on the first barrier layer. Therefore, the Chen patent does not teach the low k dielectric layer 30 as being an etch stop layer for an etch process. The Chen patent teaches that the low k dielectric layer is being etched and then another layer, such as the barrier layer, is used as an etch stop (see in addition col. 7 lines 4-6).

In addition, even though it might be true that the effective dielectric constant of the structure relied upon in the Chen patent may be less than three (upon which the Applicants do not concede) as calculated by the Fink reference, the Fink reference as well does not disclose an etch stop layer above and on the diffusion barrier layer.

Claim 1 of the present invention, from which claims 5 and 8 depend, includes the limitation of an etch stop layer above and on the diffusion barrier layer. “To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.” In *re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Because neither the Chen

patent either alone or in combination with the Fink teach or suggest an etch stop layer above and on a diffusion barrier layer as taught in claim 1 of the present invention, claim 1 is not rendered obvious by the Chen patent in view of the Fink reference.

Regarding claims 5 and 6, the Office relies on the Chen patent for a teaching of the barrier layer being inorganic and the etch stop layer being organic. However, as described above, neither the Chen patent nor the Fink reference teach or suggest an etch stop layer above and on a diffusion barrier layer as is taught in the present invention, and since all of the claim limitations must be taught or suggested by the prior art, claims 5 and 6 are not rendered obvious by the Chen patent in view of the Fink reference.

Regarding claim 7, the Office relies on the Chen patent for a teaching of an electrically conductive trace in the substrate. However, neither the Chen patent nor the Fink reference teach or suggest an etch stop layer above and on a diffusion barrier layer, and therefore claim 7 is not rendered obvious by the Chen patent in view of the Fink reference.

Regarding claim 8, the Office contends that although the Chen patent does not disclose a dual damascene structure, it would have been obvious to alter the shape of the single damascene to produce a dual damascene. However, neither the Chen patent nor the Fink reference teach or suggest an etch stop layer above and on a diffusion barrier layer, and therefore claim 8 is not rendered obvious by the Chen patent in view of the Fink reference.

Chen in view of Fink and further in view of Wang and Wolf - Claims 3-4

Claims 3 and 4 stand rejected under 35 U.S.C. § 103(b) as being unpatentable over the Chen patent in view of the Fink reference and further in view of the U.S. Patent No. 6,291,887 B1 issued September 18, 2001 to Wang et al. (hereinafter “the Wang patent”) and Wolf (Silicon

Processing for the VLSI era, Lattice Press)(hereinafter “the Wolf reference”) and in view of the U.S. Patent No. 6,448,654 B1 issued September 10, 2002 to Gabriel et al. (hereinafter “the Gabriel patent”). For at least the reasons set forth below, Applicants submit that claims 3 and 4 are not rendered obvious by the Chen patent in view of the Fink reference and further in view of the Wang patent, the Wolf reference and the Gabriel patent.

The Office contends that while the Chen patent does not disclose an organic barrier layer and an inorganic etch stop layer, the Wang patent discloses such a structure, and that the etch stop layer of the Wang patent is between 4,000 and 8,000 angstroms. However, the Applicants respectfully submit that the Office has misconstrued the dielectric layer 14 of the Wang patent to be an etch stop layer. As can be readily seen from the figures of the Wang patent, the Wang patent does not disclose that the dielectric layer 14 (of between 4,000 to 8,000 angstroms in thickness) acts as an etch stop for an etch process disclosed in the Wang patent. Therefore, the Wang patent does not teach all of the limitations of claims 3 and 4, which depend from claim 1.

Even though the Office relies on the Gabriel patent and the Wolf reference to show a dielectric constant of less than three for the relied upon structure, neither the Chen patent nor the Fink reference nor the Wang patent nor the Wolf reference teach or suggest an etch stop layer above and on a diffusion barrier layer, and therefore claims 3-4 is not rendered obvious by the Chen patent in view of the Fink reference and further in view of the Wang patent, the Wolf reference and the Gabriel patent.

B. 35 U.S.C. § 102(e)

Chen - Claims 9, 10, 16-18

Claims 9, 10, 16-18 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the Chen patent (Office Action, page 5).

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Regarding claims 9 and 10, independent claim 9 includes the limitations of an etch stop layer above and on a diffusion barrier layer. As described previously herein, the Chen patent does not teach or suggest an etch stop layer above and on a diffusion barrier layer, and therefore claims 9 and 10 which depends from 9, are not anticipated by the Chen patent.

Regarding claims 16-18, independent claim 16 has been amended to include the limitation of an etch stop layer disposed above and on the first dielectric layer. Therefore, since the Chen patent does not disclose each and every element of claim 16, from which claims 17-18 depend, claims 16-18 are not anticipated by the Chen patent.

C. 35 U.S.C. § 103(a)

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must

both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Chen in view of Fink and further in view of Wolf– Claims 12-14

Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Chen patent in view of Fink and further in view of Wolf. The Office contends that although the Chen patent does not disclose the effective dielectric constant for the relied upon structure, the Fink reference provides a readily obtainable effective dielectric constant by calculation. However, as described above, neither the Chen patent nor the Fink reference nor the Wolf reference teach or suggest an etch stop layer above and on a diffusion barrier layer, as disclosed in claim 9 of the present invention from which claims 12-14 depend, and therefore claims 12-14 are not rendered obvious by the Chen patent in view of the Fink reference and further in view of the Wolf reference.

Chen in view of Wolf– Claims 19

Claims 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Chen patent in view of the Wolf reference. The Office contends that although the Chen patent does not disclose the dielectric constant for the second dielectric layer, the Wolf reference discloses the dielectric constant of the second dielectric layer. However, amended claim 16 includes the limitation of an etch stop layer disposed above and on the first dielectric layer, and since neither the Chen patent nor the Wolf reference disclose all of the limitations of claim 16, from which claim 19 depends, claim 19 is not rendered obvious by the Chen patent in view of the Wolf reference.

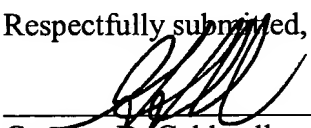
Chen in view of Bains– Claims 20

Claims 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Chen patent in view of the Bains (Nanostructured Dielectrics Good Candidates for Next Generation Computer Chips, OE Reports, No. 194) (hereinafter "the Bains reference"). The Office contends that although the Chen patent does not disclose that the dielectric constant for the second dielectric layer is about 2, the Bains reference discloses a dielectric material with a dielectric constant of about 2.2 that would be obvious for use in forming the second dielectric layer. However, amended claim 16, from which claim 20 depends, includes the limitation of an etch stop layer disposed above and on the first dielectric layer, and since neither the Chen patent nor the Bain reference disclose all of the limitations of claim 16, from which claim 20 depends, claim 20 is not rendered obvious by the Chen patent in view of the Wolf reference.

In view of the foregoing remarks, the Applicants request allowance of the application. Please forward further communications to the address of record. If the Examiner needs to contact the below-signed agent to further the prosecution of the application, the contact number is (503) 264-0944.

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Respectfully submitted,



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